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RESTORATION OF CAMARASAURUS AND LIFE MODEL

BY WILLIAM K. GREGORY

AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK CITY

Communicated by H. F. Osborn. Read before the Academy, November 11, 1919

The muscular restoration of *Camarasaurus* was preceded by careful studies of the consecutive poses of the skeleton of *Apatosaurus* (*Brontosaurus*) in three phases of the stride. These poses were worked out in a miniature model of the complete skeleton, with flexible joints. The conclusion reached is that *Apatosaurus* was a walking and not a crawling quadruped. As compared with living crocodiles the body was well raised off the ground in the stride. This is contrary to the ideas of Tornier, Hay and others, who advocated a crawling stride. The limbs, however, had not the fore-and-aft pendulum action of the perfected mammalian quadrupeds; the stride had a wide, lateral swing.

Subsequently a complete restoration of the musculature of *Camarasaurus* was made in comparison with living reptiles. The prominence of the muscle lines is justified by studies of recent alligators, in which certain muscle groups stand out as low humps in action. The pose selected was based directly on a photograph of a rapidly walking alligator, the right fore foot having just descended without the natural continuation of the stride by the hind feet.

The special points noted in the position of the bones of the skeleton are the following: Scapula gently, not sharply, inclined backward; inferior position of the scapulocoracoid, which was brought relatively near its fellow on the opposite side; spreading upper border of the scapula implying an essentially reptilian arrangement of the trapezius and other muscles; moderate bending and eversion of the elbow in the stride, the motions of the arm bones being essentially similar to those of the crocodiles but with the elbow joint less strongly flexed; digitigrade position of the bones of the fore limbs and manus. The fore limb as a whole contrasted widely with that of the mammal. Pelvic musculature and arch fundamentally similar to those of the Crocodilians. At no time did the head of the femur fill the acetabulum. The backbone is elevated above the shoulder blade in the walking pose. The tail of *Camarasaurus* is relatively smaller in transverse section than that of Crocodilians, with correspondingly weak muscles.

Camarasaurus might well have been an efficient wader. It was positively devoid of special adaptations for swimming; the pectoral and pelvic arches, and the limbs and backbone were adapted to support the great weight of the body presumably on land, as well as in wading; the tail was relatively small and feeble. There was a high ratio of limb power to weight.

The most decisive points in favor of the theory that *Camarasaurus*

was able to walk with the body well raised off the ground are the following: (1) Inability to flex strongly the elbows, evidenced by the characters of the distal facet of the humerus. (2) Ability to turn the femur well forward, like that of carnivorous dinosaurs. (3) Detailed resemblances of the femur to that of *Stegosaurus*, assuredly a straight-limbed reptile. (4) Total dissimilarity between the humerus and femur of sauropods and those of primitive Permian reptiles.

PLATO'S ATLANTIS IN PALAEOGEOGRAPHY

BY WILLIAM DILLER MATTHEW

AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK CITY

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The classic story of Atlantis has been supposed by some writers to be a genuine tradition, and to be supported by scientific evidence, which they believe indicates a land bridge across the Atlantic in former geologic times. The island of Atlantis as described by Plato they suppose to be a remnant of this bridge. Examination of the story in detail shows that it is a fable, and that the scientific evidence does not lend any support whatsoever to it nor vice versa.

The existence of a transatlantic bridge in Tertiary or pre-Tertiary times is a legitimate scientific question, which should not be confused with the fabulous story of Plato. The present writer does not, however, believe that such bridges are necessary. Their existence during the Tertiary period cannot apparently be reconciled with the known history of vertebrate evolution on the two sides of the Atlantic. The supposed arguments in their favor from the distribution of certain lower animals and plants can all be otherwise explained; and the arguments that favor a general permanency of the ocean basins afford grave objections to any such bridges, especially of such recent date, geologically.

Transatlantic bridges in pre-Tertiary times are theoretically more plausible simply because there is less positive evidence against them. The evidence adduced in their favor appears to be similar in kind to that for Tertiary land bridges, and not any more convincing. If in the one case it must be otherwise interpreted, then it should be so in the other.

The conformation of the bottom of the Atlantic is very little suggestive of any former bridges, except in the extreme north (from Newfoundland to Ireland, or across Greenland, Iceland and Scandinavia). A long, depressed, irregular trough or series of "deeps" on each side fronts the continental borders which are areas of elevation and erosion. These deeps may have been formed by the withdrawal of material that has gone to build up the lighter fragmented rocks of the continental platform borders,